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Motion Imagery Metadata Standards

Increased reliance on the use of Unmanned Aircraft Systems (UAS) has resulted in a high number of available sources of Motion Imagery (MI). The collection and exploitation of motion imagery has increased the need to be able to search for and retrieve the vast amount of MI data that is being disseminated by these sources. Discovery of motion imagery is dependent on the ability to standardize MI formats, such as video, audio, and associated metadata formats. The Motion Imagery Standards Board (MISB) was established to champion the use of standards by motion imagery systems in order to ensure interoperability, including the development and implementation of metadata standards. The MISB formulates, reviews and recommends standards for motion imagery, associated metadata, audio, and other related systems for use within the DoD/IC/USIGS[1]. The MISB supports the GEOINT Standards Working Group chartered to support the NGA Functional Manager responsibilities for standards.

This article examines the current state of MISB metadata used by UAS as a means to promote discovery.

Background

The MISB function has existed in various forms since February 2000. It evolved from the Video Working Group initially involved in the development of metadata standards to promote the exploitation of motion imagery collected by the Predator (MQ-1). Metadata existed in the form of Electronic Support Data (ESD) related to the platform and was embedded in the analog motion imagery stream. This ESD data formed the basis for the metadata tags used by systems performing exploitation and storing the derived products. The transition from analog to digital motion imagery provided the backdrop for expansion of the ESD rudimentary metadata tagging scheme into the current state of the MISB involved in all aspects of metadata standards, both commercial and DoD. This expansion led to the development of a metadata registry for Key Length Value[2] (KLV) metadata, as well also establishing and maintaining the motion imagery standards and metadata for current and future UAS.

Current Standards

KLV (Key-Length-Value) is the current metadata standard recommended by the MISB. It is a Society of Motion Pictures and Television Engineers (SMPTE) standard adopted by the MISB for digital encoding of metadata in motion imagery streams. The MISB maintains registries of the KLV metadata tags to be used in support of UAS operations. These tags are called out in MISB Standard 0601, which provides guidance on a reliable, bandwidth-efficient exchange of metadata among digital motion imagery systems on UAV platforms[5].

The MISB AAF [*Advanced Authoring Format*[3]] Profile for Aerial Surveillance and Photogrammetry Applications (ASPA) has evolved into one of the standards used to archive digital motion imagery in the DoD and IC communities. It is backward compatible with previous standards[4] documenting Predator (MQ-1) motion imagery metadata. It provides a wrapper for motion imagery, including the KLV metadata, to be stored

in an efficient manner while maintaining interoperability across platforms. This standard is used successfully to archive motion imagery products created from Predator resident on the NGA Image Product Library (IPL) in AAF format.

Additional metadata standards are used to describe other aspects of motion imagery used by UAS. These standards describe digital motion imagery instances as related to data links[5] and segments created from streaming data[6]. These standards are available for downloading from the MISB web site at http://www.gwg.nga.mil/misb.

Current Usage

The below chart[7] recaps currently fielded UAS and the motion imagery format and metadata standards that are in use.

Country	Platform / System	FMV Analog	FMV Digital	Metadata Analog	Metadata Digital
US	MQ-1 Predator	RS-170A	N/A*	Closed Caption ESD	N/A*, KLV EG0104
US	MQ-1 Sky Warrior	N/A	480P, MPEG2 / H.264 Proposed	N/A	KLV STD0601 Proposed
US	MQ-9 Reaper	RS-170A	N/A*	Closed Caption ESD	N/A*, KLV EG0104
US	IGNAT Extended Range / Warrior Alpha	RS-170A	N/A*	Closed Caption ESD	N/A*, KLV EG0104
US	Common Sensor Payload Program	N/A	480P / 720P, H.264 Proposed	N/A	KLV STD0601 Proposed
US	Scan Eagle	RS-170A	N/A*	C2 Channel ESD	N/A*, KLV EG0104
US	MQ-8 Fire Scout	RS-170A	Converted to MPEG2 on Platform	N/A	KLV Set
US	RQ-7 Shadow200	RS-170A	N/A**	Closed Caption ESD	N/A**

Summary

MISB provides a foundation for consistently describing motion imagery from multiple vendors' sensors. As such, it has become the *de facto* standard and basis for transparent discovery. Because the MISB standard has been readily embraced by the sensor manufacturing community, it has allowed for sensor diversity with no impact on metadata discovery. The use of motion imagery metadata is evolving and as UAS come online they include the standards brought about by the MISB. This reflects the importance of metadata in determining the necessary tags needed for discovery of ISR assets in the DoD/IC communities. Continued awareness of the available standards and the need to standardize metadata will increase the availability of motion imagery data to all interested and necessary consumers.

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[1] http://www.gwg.nga.mil/misb and for additional information regarding MISB activities
[2] SMPTE 336M-200[7], *Data Encoding Protocol Using Key-Length-Value*
[3] Advanced Authoring Format (AAF) Object Specification v1.1
[4] MISB Engineering Guide (EG) 0104.5, *Predator Metadata Sets*
[5] MISB Standard 0601.2 *UAS Datalink Local Metadata Set*
[6] MISB Recommended Practice (RP) 0608.1 *Motion Imagery Identification*

[7] STANAG 4609 implementation status brief from MISB conference May 2009